The long-eared hedgehog (Hemiechinus auritus) is a species of hedgehog native to Central Asian countries and some countries of the Middle East including Iraq [1]. This Hedgehog is insectivorous, but may also feed on small vertebrates and plants. Hedgehogs belong to the family Erinaceidae, order Insectivora [2, 3]. The long-eared hedgehog is an insectivore; 70% of its diet consists of insects, beetles and caterpillars, with some worms and a tiny amount of slugs and snails. 11% earthworms, 10% bird eggs, 5% mammal meat, 3% millipedes, 3% earwigs, 2% bees, 1% bird meat [4].

Tongue is a highly muscular organ covered in stratified squamous epithelium primarily conducts several tasks as a tactile and taste organ but is also involved in vocalization and transportation of food [5]. On the surface of tongue, there are various kinds of lingual papillae including filiform, fungiform, and circumvallate papillae, each having different morphological structure and shape. Distribution of these lingual papillae has been considered to be related to species’ eating habits and vocalization [6].

Literature on the anatomical and histological peculiarities of tongue in hedgehog is scanty. Despite some macro-anatomical investigations on the tongue in insectivores such as the pangolin [7], lacerated lizards. [8] and Bat [9]. To bridge the deficiency, the present work was undertaken

INTRODUCTION

The aim of the present study was to investigate the anatomical and histological structure of the tongue in Hedgehog. For this purpose, the tongues of 10 adult hedgehogs were dissected. Their weight, length and wide were measured and photoed. Then, they were fixed in 10% nutrient buffer formalin and prepared by tissue processing (fixation, dehydrated, clearing and impregnation). The serial sections (6 ) were stained Haematoxylin and Eosin stain and periodic acid Schiff reagent. The results showed that the free rostral part, is slender shape with round slightly flattene tip and the longitudinal median groove is absent along entire dorsal surface of the tongue, also the torus linguae is absent. The length, width and thickness are presented in Table (1). Four types of lingual papillae with different distribution and density were observed on its dorsal surface. Filiform papillae with the highest density and distribution were whole of tongue,fungiform papillae are distributed among filiform papillae three circumvallate papillae on posterior part of the tongue, but the foliate papilla is rudimentary. The dorsal mucosa, unlike the ventral is thrown into papillae of different shapes and types. The conical light caudally directed filiform papillae covered with keratinized stratified squamous epithelium. Fungiform papillae were observed as fungi-like shape; with narrow base is slightly keratinized epithelium, circumvallate papillae also present. Mucous and serous glands were in ventral surface of tongue in lamina properia or among muscle bundles.

MATERIALS AND METHODS

Ten hedgehogs of both sexes were used (Fig. 1). Each animal was weighed alive and sacrificed by dislocation of cervical vertebrae after anesthesia with anesthetized intra muscular ketamin zylazin (15mg/ kg body weight), the mouth of the hedgehog were opene

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RESULTS AND DISCUSSION

Anatomical study

The length of tongue of Iraqi hedgehog in the present study (27.98±0.37 mm) (Tab.1) is in disagreement with [11]. Who found the length of tongue of the feathertail glider was (9-11 mm). It could be divided in to three parts the rostral lingual apex, middle lingual body and caudal lingual root. The free rostral part, presented as a slender shape with round slightly flattened tip as noticed in White fallow deer [12]. Sambar deer [13], also this result in agree with the results of [14] in porcupine and [15] in Rat, [16] in Geomyid and Heteromyid Rodents (Fig. 1).The dorsal and ventral surfaces facing the palate and the floor of the mouth cavity respectively. The two surfaces met at the rounded lateral borders. The longitudinal median groove is absent along entire dorsal surface of the tongue. This result is nearly accordance to in Rat [15] was distinct and [17] in mice where the groove is restricted to the rostral part only. And disagrees with [18] in adult rams who mentioned that the median groove was conspicuous, and [14] in porcupine also [19] in bank vole. From the ventral surface of the tongue a wide median lingual fold frenulum attach it with the floor of the mouth cavity, like most the mammalian mammals [20] (Fig.3)

The lingual body constituted the bulk of the organ and has not prominence along the dorsal surface of the tongue in contrast with [21] in guinea pig and Rat [15]. On the other hand, the Palatine ridges, form impression on this surface (Fig. 2).Hence this variation in the morphology of tongue suggests functional adaptation and related to their diets. The mucous membrane of the tongue presented different types of papillae such as filiform, fungiform and vallate giving it a rough appearance. The caudally directed, pointed filiform papillae were distributed throughout the dorsum. The fungiform papillae were scattered among the filiform papillae over the entire dorsum. They were more numerous along the edges of the apex of the tongue. Circumvallate papillae are largest and least numerous present as three papillae located on posterior end of the dorsal surface of lingual body. This resent result in agreement with Rousettus aegyptiacus Bats [9] and disagree with [19] the in bank vole. Rudimentary foliate papillae located on each of tongue. They appeared as a series of limited parallel folds separated from one another by shallow furrows.(Fig .1) This resent result disagree with the result of previous others whom mentioned there are well developed foliate papillae [22] in hamster, [21] in guinea pig, [23] in the rabbit, [19] in bank vole, [24] in mice and disagree with the result of [25] who found that this is absent in Formosan serow also in wistar rat [26].The body and the root were wide and were attached to the floor of the mouth. The root of the tongue sloped caudally and ventrally towards the base of the epiglottis. In the root, the lateral margins were not distinct. The root was connected with the soft palate by two lateral mucosal folds, the palatoglossal arches. (Fig.2 and 3)

Histological study

Histological examination revealed that the mucosa of the tongue consists of an outermost keratinized stratified squamous epithelium beneath which is a dense network of connective tissue called the lamina propria, enriched with blood capillaries. The lamina propria is intermingle with the muscular core. (Fig.4)

The dorsal mucosa, unlike the ventral is thrown into papillae of different shapes and types – filiform, fungiform, circumvallate and foliate papillae. (Fig. 4 and Fig. 5).This result like the result of [11] who recorded that the ventral surface of tongue of the feathertail glider unlike the dorsal surface is smooth without papillae. And disagrees with the result of [7, 8]. This difference due to type of food of this animals and different habit of nutrition. The conical light caudally directed filiform papillae covered with keratinized stratified squamous epithelium that provide the former functions are principally mechanical in their activity and serve to facilitate the movement of food material into oral cavity and pharynx and this agreement with in other animals like in porcupine [14]. Those papillae are distributed on the dorsal surface of tongue are elongated, thorn-like structures. A connective tissue core of filiform papillae were thick, and deeply engaged within the epithelium, usually have only one papillary projection (Fig. 1) like [27] in two genus bat and unlike [28] who mention that the tip of each filiform papillae of mice tongue was divided into two or three processes.

Histological examination of these papillae revealed abundant keratinized tissue and have different heights and thicknesses at various levels, it is most dominant. This result in agreement with the results of [28] in mice. Fungi form papillae were observed on the dorsal surface of the tongue as a fungi-like shape, with narrow base is slightly keratinized epithelium and taste buds distributed on the lateral and dorsal surface (Fig. 6) similar result has been reported for the fungi form papillae of Rousettus aegyptiacus Bats [9]. Valate papillae were observed on the posterior part of the dorsal surface and present a rounding shape delimited by a deep groove and covered with stratified squamous epithelium with slightly keratinized. These papillae possess taste buds on their lateral wall that open up on the groove. (Fig.7)

The taste buds are epithelial structure associated with terminal fibers of glossophaltangular and facial nerves, each bud consist of taste pore which is an open onto epithelium of tongue, and taste chamber lined with sensory and sustentacular cells.

The muscular core of the hedgehog tongue consists of a mass of skeletal muscle bundles that run in transverse, longitudinal and oblique directions (Fig.4).The spaces between bundles are filled with loose collagenous tissue, and capillaries also seen. This organization of tongue muscle is similar to that in mammals [20], in rabbit [29]. This complexity of muscular of tongue due to this animals feed by using their tongue.

<table>
<thead>
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<th>Table (1) showing the parameters of Tongue in Hedgehog.</th>
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<tr>
<td><strong>Body weight</strong></td>
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<tr>
<td><strong>Tongue weight</strong></td>
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<tr>
<td><strong>Tongue length</strong></td>
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<td><strong>Tongue width</strong></td>
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<td><strong>Tongue thickness</strong></td>
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<td><strong>Values represent mean ±S.E</strong></td>
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Groups of mucous PAS positive, serous and mixed glands in considerable numbers exist in the area of the lingual. This variation in types of gland reflects the facts that the hedgehog feed is varies soft tissue as meat eggs and dry like insects. This current research will support the previous studies which recorded that the hedgehog consuming insects and other soft feed [2, 3, and 4].

The clustered glands are not restricted to the tunica mucosa but extend deeper between the muscle fiber bundles and lamina propria of ventral surface of the tongue. The glandular ducts end in the Connective tissue septa (trabeculae) sectioned striated muscle fibers are present between the glandular lobes (Fig. 5 ). The mucous membrane of ventral surface of the tongue consists of slightly keratinized stratified squamous epithelium and has not lingual papillae (Fig.5).

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